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THE
MATHEMATICS TEACHER

A MAGAZINE DEVOTED TO THE
INTERESTS OF TEACHERS OF MATHEMATICS

Volume II

December, 1900

Number 2

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Published Quarterly by the

ASSOCIATION OF TEACHERS OF MATHEMATICS
FOR THE MIDDLE STATES AND MARYLAND

LANCASTER, PA. SYRACUSE, N. Y.

NEW YORK, N. Y.

PHILADELPHIA, PA.

THE MATHEMATICS TEACHER

A MAGAZINE DEVOTED TO THE
INTERESTS OF TEACHERS OF MATHEMATICS

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THE MATHEMATICS TEACHER is published quarterly—September, December, March and June—under the auspices of the Association of Teachers of Mathematics for the Middle States and Maryland.

The annual subscription price is \$1.00; single copies, 35 cents.

Remittances should be sent by draft on New York, Express Order or Money Order, payable to The Mathematics Teacher.

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EDITED BY
W. H. METZLER

ASSOCIATED WITH
EUGENE R. SMITH JONATHAN T. RORER

VOLUME II

DECEMBER, 1909

NUMBER 2

A FEW ALGEBRA METHODS.

BY PHILIP R. DEAN.

Granted certain favorable conditions such as: (1) a thoroughly trained and broad-minded teacher, (2) reasonable-sized classes, and (3) pupils mature enough for the work at hand, two things seem to me highly essential for the best teaching. These are (a) well-grounded methods; and (b) daily and sympathetic planning of each lesson.

Good teaching is hard work even to the man who loves it intensely. We are before a class for forty-five minutes daily: are we realizing our opportunity if we lose time for them through our own poor administration of the work, or our failure to perceive at once any difficulty that arises and its remedy—or again, if we lack that “entire command” of the subject and fresh familiarity with the day’s topics which insure the respect of the whole class?

It is said among public speakers that it is a long lesson to learn to extemporize well, and that the best preparation is to begin by writing out carefully the first speeches and learning them verbatim; after that fewer and fewer words need be written out ahead, but always the great extempore speech consists of material well thought out beforehand but fused afresh into glowing substance by the inspirational fire of the occasion.

So, too, must it be with musical improvisation. Lowell’s “musing organist” “lets his fingers wander as they list” only

when he has mastered the technique and can depend on these mechanical means to express *sua sponte* his deeper feelings.

Is it not thus in our teaching? We must struggle, by long studied practice, to be able to reproduce, the first year perhaps, some one teaching method, which we have thought out carefully; then similarly other methods, until gradually we may move with confidence, and may come before a class with only the immediate subject matter vividly in mind.

This amounts to training the intuition coupled with a mastery of several recognized methods. An experienced resourceful teacher feels quickly when he is not succeeding. Happy he if, in his preparation, he has anticipated this particular situation and is ready with exactly *the* method needed.

I maintain that, even with large classes, it is well worth while to give several minutes before any recitation devising a method especially to reach some backward pupil without sacrificing the others. There is satisfaction in success of this kind; and indeed I have no sympathy with the teacher who says that such and such a pupil "cannot learn mathematics." That teacher is but admitting his own impotence.

George Herbert Palmer gives voice in one of his recent books, to the idea that the great teacher can only be he who delights in *teaching*, and who loves the work for its own sake. We cannot all be great teachers, but we can catch glimpses of the ideal if we can rise to sympathetic touch with the movements of our time and keep our own minds so keenly alive to the learner's view-point that we must ever try to give him our best,—even as *we* should expect from one who stood before *us* to instruct.

I have been in classes under college professors where I was morally certain the instructor had not made a minute's immediate preparation. I got nothing out of it and despised the man. Nay more, I have stood before classes myself when I did not really know, except as I stumbled on them accidentally, what points were the difficult ones to the pupils, nor how to go at these points. I could give the majority of the class perhaps nothing, and, as maybe beads came out on my forehead, I have despised myself in deep humility.

I believe that, with all rigor and exactness, mathematics should be taught psychologically rather than logically. Somewhere, in Preyer or Sully, I read years ago before I was

married, that the young child was certain "vastly to be influenced by his surroundings and in turn vastly to influence them." In my greenness I smiled at this last phrase for I could not see how. And yet as I think of it now, I believe the truest word ever said to teachers is—"And a little child shall lead them."

Methods, then, should not be looked on as a means of saving the teacher time and energy—but rather, each new one should be judged by its possibilities for increasing the teacher's efficiency.

I shall not attempt a summary of well-established standard methods such as the "chalk and talk" of Professor Young, and the methods of awakening interest and checking results discussed by Professor D. E. Smith. I can only mention a few not written so much about.

A good friend of mine, once in an important oral examination, was asked when the "concert method" should be used. He thought a minute and answered, "When the exercise is a written one!" Now this expressed exactly what we were trying, under Mr. Anthony, of DeWitt Clinton High School, six years ago, to do to get at every pupil in our crowded classes. The method was used at various stages of the work. As many pupils as possible were sent to the board; the others at their seats with paper. Dictation (all listening): "The sum of the cubes of a and b ": a second's pause, a signal and all turn and write it quickly. Again: "All write x equals tens digit, y equals units digit:—Attention! Express in algebra the number." At signal all write $10x + y$. "Attention! Express the number formed by doubling tens digit." Signal after pause and all write. "Attention! Write the algebraic statement that the number formed by doubling tens digit is 200 less than the square of the given number." Pause and then all write. If the questions are "thought provoking" and the pauses properly timed any one in the room can see at a glance which pupils are doing the thinking and obtaining the answer unaided. Moreover, the teacher has ever before him evidence showing exactly how well the class, as a whole, is keeping up with the development of the topic, as he outlines it, and where drill is needed. We found this method especially good at introducing new branches of the work, and in drilling on algebraic symbolism or shorthand. It demands of the teacher, in a high degree, skill and keenness. He is put in a strategic position where

success or failure depends largely on his own judgment. The best results are reached, as hinted, only after long practice.

Another good time-saving method is to have some one boy bring to the teacher each morning, made out on cards, the assigned examples for the day. The teacher can then mix in a few of his own, including one or two especially designed for the brilliant pupil's wings, and perhaps several review ones, and then be able to have a dozen or twenty pupils at the board working almost as soon as the bell has ceased ringing. This card device also enables the teacher easily to lay aside at the end of the period work which needs consideration the next day. It seems wise to have each pupil put at the top of the board exactly what is on his card, that all may fully understand the problem. After a few minutes of board work the rest of the period may well be given to explaining—all sharing as the teacher directs the questions. Occasionally for review it is well to let each pupil erase and take another card on the same or a different topic as soon as he finishes his example correctly. In this way each pupil may do several during one period. A simple library bureau index scheme keeps the old cards classified, and if the teacher extends the system he may work out a color idea, as blue cards for elementary algebra, yellow for plane geometry, red for trigonometry, etc.

Perhaps I may mention two methods for particular topics. It seems to me that the fundamental theorem of fractions is $a/b = ma/mb$, *i. e.*, that multiplying or dividing both terms of any fraction by the same quantity does not alter its value. If at the beginning of fractions in first-year algebra the pupils are convinced of the truth of this—or in the third-year algebra it is proved outright—the whole subject of adding and subtracting fractions becomes very simple. So, too, most complex

fractions yield readily; *e. g.*, $\frac{5 + \frac{2}{x} + \frac{3}{x^2}}{6 - \frac{2}{x^3}}$ becomes at once

$\frac{5x^3 - 2x^2 + 3x}{6x^3 - 2}$. Also the tricky case where one denominator

has a (-1) factor becomes play;—*e. g.*, $\frac{5}{a-b} + \frac{2}{a+b}$

$+\frac{6a}{b^2-a^2}$. The last term of course is seen at once to be

$-\frac{6a}{a^2-b^2}$. This one theorem so permeates as a principle the whole subject of fractions that it might well be established at the outset and quoted and used thereafter whenever possible.

"In the spring a young man's fancy lightly turns to thoughts of base ball." Now base-balls mostly move in one curve—the parabola; and I think we owe it to our pupils at least to introduce them to this curve. Most will never get it in any other way. This brings me to my other suggestion. When teaching graphs, is it not worth while—at least in advanced algebra—where we do teach the simplest derivatives now (as in multiple roots and possibly Sturm's functions), to explain the meaning of dy/dx , as applied to a curve, and show how, knowing it, really helps get the direction of the curve at any point and is especially useful in revealing the turning points. I found one class was stimulated to intense interest by a very simple illustrative example in maxima and minima. The teacher has an unusual chance here to suggest the possibilities in higher mathematics and perhaps to interest boys going on. I have found particular success in attempting this work after final examination week. Many will delight in exploring graphs of higher degree—or even transcendental ones—and occasionally really ingenious discoveries will come out from the young Descarteses, Newtons, or Argands and even the girls enthuse over a goodly mixture of colored crayon or the study of families of curves.

One last word may not belong in that inquiry allotted to this paper, but I venture to speak it as it only goes back a step in the study of good teaching. Most of us have something to say as to what grades of work we shall teach during a given term. Many have the planning of a whole department of teachers. Now I ask, if we wish to raise our educational work to the standard of a profession is not the topic elementary mathematics a narrow enough one for one individual in which to be a specialist? We perhaps cannot expect to remember the Greek, or the history which college gave us; but ought not each teacher of mathematics to be at any time as familiar with any topic taught in high school mathematics as he would be if he had taught it himself, say within three years?

It seems to me that if we all could do this, a closer sympathy would grow up in studying mathematical teaching problems and undoubtedly better teaching would result. I would myself like to learn integral calculus through teaching it instead of reviewing it occasionally in summer schools—I would even have the college and technical school professors try a term with some of our beginners. Perhaps the idea of exchanging professors may develop so that something like this may in time be possible. But for the present we secondary men have within our grasp the opportunity to learn well the adolescent mind and the branches of mathematical thought which are deemed suited to it.

I speak feelingly for I myself have made the mistake of teaching no pupils fresh from the elementary schools for several years. When discussion arose as to whether some particular examination question was a good one for the 1a pupil, I found I could not tell *myself* I really knew. This spring, however, I have an advanced algebra class and a beginners' one in successive periods, and I am frank to state that although the classes are exactly the same size—27 in each—the preparation for the latter and the checking of the work require twice as much energy and time from me as does the advanced algebra class.

Possibly a good teacher will do only fair work the first time he teaches a given grade; he ought to do first class work his second time and finished work the third. It seems to me that about four or five repetitions of a grade is all the ordinary teacher can stand together without getting in a rut. Is it not far better to swing around the whole circle occasionally, holding on not by one grade alone but in two or three places at a time? It is easier far to teach only a little field, and I know many teachers who insist they prefer to do so: but in the long run I feel that such a practice does teacher and pupil a wrong—let no man despise thee! Not even the lordly member of the senior class.

To sum up, then; it seems to me (1) In addition to general culture and breadth which we get by keeping alive on current movements and the deeper branches of our work, we need sympathetic touch with our pupils. This is obtained best by spending daily a little time beforehand over what we are asking them to study. (2) Devices which economize time and reach every

pupil in large classes are necessary to-day. Every pupil has a right to an opportunity and we must recognize that some get their earliest perception through one sense and some through another. Good devices often require long practice and great skill from the teacher. (3) Every teacher should, so far as possible, master a grade and the peculiar pedagogic difficulties the first time he teaches it; and should never let himself grow unduly rusty on any part of high school mathematics.

Good *teaching* is what our secondary schools to-day need rather than highly specialized scholarship or philosophical quibbling. Thus will the standard of our calling tend to rise to its true position—the noblest of the professions.

CURTIS HIGH SCHOOL,
NEW YORK, N. Y.

MATHEMATICS FOR TRAINING AND CULTURE.*

BY W. H. METZLER.

To start a reform requires sufficient energy to overcome the inertia of long habit and custom and to get out of the ruts it is often thought necessary to pull with so much force that the wheels are far beyond the level track before the energy is expended or the fact realized.

The history of the teaching of mathematics shows a series of fluctuations from one point of emphasis to another, and all reform carries with it a good deal which in time is set aside as worthless. Some reformers see little or no good in anything of the present, but think because some things are not what they should be all should be upset and an entirely new structure built upon new foundations. True reforms seldom, if ever, come in this way. Certainly the reform in the teaching of mathematics will not, but much of the present and of the past will be found best for the future.

The spirit of the age and country affects much the spirit of the schools, so we find many thinking that the spirit of commercialism, so prevalent in this age and in this country, should guide our school life and teaching. This is the age of commercial and trade schools and I do not think we have enough of

* Read before the New York Section.

them, but I do not want all schools pervaded by the same spirit and aim we find for the most part in them. I feel quite sure that some of these schools would be improved by a modification of their spirit and aim. I am not as yet convinced that it is the duty of the state to support schools the object of which is to teach trades or direct means of making a livelihood. I would certainly maintain that this duty did not exist outside the large centers of population. It is the duty of the state to support schools whose object is the making of better citizens. To aim at the purely practical, commercial or utilitarian is to aim at the level of mere existence which is the level of the beast. To rise above this level the aim must be to reach the elements of training, culture and morals. The possession of these is what makes one citizen superior to another who lacks them. I believe that every individual, in so far as it is possible, should earn his own living, but a citizen that can make a living for himself is not necessarily a good citizen. Indeed he is not a good citizen unless he goes beyond this and makes a better man out of himself and helps others to be better, unless he leaves the world better for his having lived in it. Men should be judged by what they are and do, not by what they possess. Unless the millionaire uses his money for the betterment of mankind he is of no benefit to the world for possessing it. Unless the scholar uses his training for the same purpose, he likewise is of no benefit to the world because he possesses it. It is the duty of every one to get all the wealth he can honestly, and to obtain all the knowledge and training he can, but it is much more his duty to use these things for the benefit of mankind. It is the giving-out process that is more important than the taking-in. Now the emphasis of those who aim at the practical or utilitarian is on the getting rather than on the giving-out. To emphasize the taking-in process is to emphasize selfishness, but to emphasize the giving-out is to emphasize unselfishness and to build up true character which is necessary for good citizenship. Good citizenship means good character, good character means altruism; while utilitarianism tends towards selfishness. None of the truly great characters of the world were selfish. True greatness and selfishness cannot exist together.

The tendency seems to be to hold up before the youth of today, as examples worthy of emulation, men who have acquired

great wealth, while little or no reference to how they got it or to how they are using it. Not long ago I heard an educator say "We want to instill in our youth the ambition and spirit to get there." With this I have no immediate quarrel, but I want to know *how* my boy gets there and *what* he has got after he gets there. I want him to strive and to strive hard but it must be for something worth while. It must be for something he can use for the good of the world and not a mere possession of little use to him and of less to others.

The world needs more philanthropists, but it also needs to recognize that there are philanthropists other than those who give of their money. He is no less one who gives of his time, his education, or his very life for the good and betterment of others. Are there no philanthropists in the school room? The examples we hold before our pupils should possess less of the commercial and more of the altruistic.

Education means to lead out and not to feed in. It means the systematic development and cultivation of mind and heart. To cultivate is to prepare the soil for growth and development. To cultivate the mind is to improve and develop it by study and effort. Culture is the result or product of cultivation.

As for a vigorous physical life there must be food, exercise and rest in proper proportions and at proper intervals as long as such life is to last, so for a wholesome vigorous mental life there must be mental food, mental exercise and mental rest in proper proportions and at proper intervals. It is the business of the schools to prepare the student so they will be enabled to take these all through life, and not have their school days one long period of taking mental food, followed by another long period of mental rest.

To emphasize the practical and ignore training and culture will result in anything but a vigorous mental life. Such emphasis is like sowing seed upon uncultivated ground, in which case the birds of forgetfulness soon devour most of it and what little grows will not yield much fruit. The seeds of methods, principles, habits and morals must be sown on well-cultivated ground when they will yield some thirty, some sixty, and some an hundred fold, and the beauty of the crop is that it never grows less and is always ready. If there is no cultivation or culture there is no exercise or effort and where there is no effort there is no

development and where there is no development atrophy and death result.

In my judgment the most important work of every teacher is the moulding of character, for without that no one is fitted for any walk of life. Character is what counts even more than training. The two should grow together. In speaking of the college man as an engineer Mr. F. W. Taylor, in the *American Machinist* for October 7, 1909, says that for success, "Without the slightest question character comes first."

In this country and particularly in the large cities, with so many of foreign birth, where the schools must be responsible for so much of the pupils development if they are to reach higher than the mere plane of existence and of making a living, the training and culture elements are to be ever uppermost and must be constantly and for ever emphasized to attain the results necessary for better citizenship. Is it not a lack of culture and morals that makes the problem of the East Side in New York? If all the citizens of Denver were cultured and honest would Judge Lindsey be having such a fight as he is? Surely no one interested in our schools desires to introduce in them more of the spirit of commercialism or to intensify this spirit. The problem of the foreign element and good citizenship will be solved better and sooner by getting away from this spirit and emphasizing more the training and culture side of subjects.

I am inclined to think that there is a good deal of misapprehension as to the practical value of mathematics. Outside of the fundamental facts of arithmetic there are very few of the facts of mathematics put into direct use by people in general. These then are not the most important things, but the methods, principles, and the type of thought involved in mathematics are so universal and independent of time and place (as all civilized people have them) that no education can afford to neglect them. To be sure the facts of mathematics and its practical applications are of very great indirect importance to the race and of direct importance to a few individuals, but of vastly more importance to those in school are the modes of thought which it exemplifies. The practical side of mathematics is of value to the few while the culture side is of value to all. This in itself should be sufficient to decide where to place the emphasis.

All thinking results or should result in conclusions and our

thinking and actions are influenced by other conclusions. The facts of everyday life on which we base our reasoning are so many and so complicated that drawing conclusions is not an easy or simple matter. It is the business of the schools to train students to the habit of drawing correct conclusions and of reasoning accurately. No other subject in the school curriculum can do as much in this direction as mathematics if taught properly. Its mode of thought and its conclusions are of the same type as found in everyday life. Its conclusions are certain and proceed from the easy to the more difficult, and as a preparatory training to the difficult conclusions of life this is of great importance.

In the reasoning of everyday life we estimate the correctness and completeness of the facts and on the hypothesis that they are true draw our conclusions. In mathematics the student is taught to reason out the steps for himself, he must pick out the essentials, and at every stage there is an act of judgment and reasoning brought into play as to the next thing to be done and the best way of doing it. There must stand out clearly what is given and what is to be done, what are the tools to do it with and how they are to be used, and at the end it must be clearly seen that the conditions have been met. This must become a habit of the pupil's life and when so he has something with which the practical side has no comparison.

Those who advocate mathematics for purely practical purposes, to be consistent, should remove everything from the curriculum except those things which promise a direct reward from without themselves. This done there would be little left. Even play which finds its end within itself would be banished from the child life. Indeed it may be questioned whether it is not true, that, in harmony with the spirit of the times, the sports of the high schools and colleges of to-day have not shifted the end of these sports from within to without, and they are no longer ends in themselves but means to an end.

Let us hold up before our pupils then, ideals that will counteract this tendency rather than those which intensify and prolong it. Let us show them that many things are done for their own sake and that they should not be always looking for direct rewards for their labors. Yes let us even show them that some things should be done for the benefit of humanity. In order that you may see what others who have had good opportunity to

study the results of our school work have to say on this point, let me quote from Mr. J. G. P. Stokes, the philanthropist and settlement worker of New York city. He says: "Until recently it appears to have escaped public notice that this constant emphasis (given by the schools) upon the importance of personal success, unless safeguarded by suitable ethical training, tends subtly to the development of selfish propensities, that lead the individual to disregard or subordinate the interests of others, in the furtherance of personal ends; and that lead to unsocial attitudes, and to unfriendly rivalries and ill-feeling, and to wrong doing of every sort. The constant encouragement given to personal ambition or personal triumph and personal reward tends to develop a desire similar to that possessed by the criminal offender, who, in seeking his personal gratification, gives no proper regard or consideration to the relation of his acts or of his course to the welfare of others or to the welfare of the community."

I have elsewhere (*Journal of Pedagogy*, June, 1905) gone into some details as to the educational value of mathematics and have shown how the proper study and teaching of it develops every power and ability which characterizes the educated being. I will not therefore tire you to repeat these details here, but I would like to add some other points to those which I have already mentioned in this paper.

In mathematics more than in any other subject the student is enabled to discover for himself and to enter into the real spirit and enthusiasm of discovery. It is here that he can have, as nowhere else so early, mental activity for its own sake, in which case his stimulus comes from within, the source of all good stimuli. Its finished form makes it the model or ideal for all sciences. Mathematics has a large esthetic as well as ethical value. Poincaré says: "Mathematics has a triple end. It is to furnish an instrument for the study of nature. But that is not all. It has a philosophic end, and I dare say it, an esthetic end. . . . Those skilled in mathematics find in it a pleasure akin to those which painting and music give." Shellback says: "Who does not know mathematics and the results of recent scientific investigation, dies without knowing truth."

I know of no other subject which furnishes a more valuable training in logical thinking or in clear and concise expression,

and in fact, for training all students for general service, mathematics is surpassed by few if any subjects. In order to see how other countries look upon it let me give a few quotations from Europe. From the Prussian curricula: "For the secondary schools, the most important task of instruction in mathematics lies in a training of the mind which enables the pupil to use correctly in his own independent work the intuitions and knowledge which he has acquired. In all domains of this subject the aim must therefore be to attain a clear understanding of the theorems to be developed and their deduction, as well as practice and skill in their use."

From the Austrian curricula: "Instruction in mathematics has in general the important duty of coöperation in the development of the power of thought of the pupils, to lead them to the formation of independent judgment, to facilitate the understanding of the laws of nature, and no less than any other branch of instruction to cultivate the clear expression of thought in correct language.

"Consequently, such portions of elementary mathematics have been incorporated into the curriculum as have a recognized high culture value, and in an order corresponding to the progressive mental development and power of comprehension of the pupil. Incidentally, the selection has also to take into account the needs of practical life and the connection of mathematics with other fields of knowledge, notably with the natural sciences."

From the German Society for the Advancement of Instruction in Mathematics: "In the secondary schools mathematics should be a part of general culture and not contributory to technical training of any sort; it should cultivate space intuition, logical thinking, the power to rephrase in clear language thoughts recognized as correct, and ethical and esthetic effects; so treated mathematics is a quite indispensable factor of a general education in so far as the latter shows its traces in comprehension of the development of civilization and the ability to participate in the further task of civilization. Accordingly applications of mathematics to problems from the field of the natural sciences, geography, and the relations of human society are to be constantly made, though without endangering the independent importance of mathematics."

To sum up, I plead for the study of mathematics for the training and culture it contains because:

1. While recognizing its great practical value to the race it is only here and there we find an individual who will ever apply it (outside of the fundamentals of arithmetic) in a practical way. But, on the other hand, it furnishes a type of thought and training which is universal and used every day by every person.

2. Even in the matter of making a living the training and culture derived from mathematics furnishes an equipment which in value far outweighs, for most people, the direct practical value.

3. The spirit of the age is commercial, and to emphasize the utilitarian view in the schools is uncalled for, misleading, and undermining the morals in that its tendency and spirit is selfish and not altruistic; while the study of mathematics for training and culture—the study of mathematics for its own sake—leads to unselfishness and makes better citizens, and it is better citizens the schools must produce.

If properly studied and taught mathematics will develop all the powers of mind and heart, and one of the great needs of the world today is well trained minds and larger hearts—men and women who have high ideals and who are willing to live and work for humanity's sake.

There are hermit souls that live withdrawn
In the place of their self-content;
There are souls like stars that dwell apart
In a fellowless firmament;
There are pioneer souls that blaze a path
Where highways never ran.
Let me live in a house by the side of the road
And be a friend to man.

Let me live in a house by the side of the road,
Where the race of men go by,—
The men that are good, the men that are bad,
As good and as bad as I.
Then why should I sit in the scorner's seat,
Or hurl the cynic's ban?
Let me live in a house by the side of the road
And be a friend to man.

I see from my house by the side of the road,
By the side of the highway of life,
The men that press on with the ardor of hope,
And the men that are faint with the strife.

And I turn not away from their smiles and their tears,—
Both parts of an infinite plan.
Let me live in a house by the side of the road
And be a friend to man.

I know there are brook-gladdened meadows ahead,
And mountains of wearisome height,
That the road stretches on through the long afternoon
And passes away to the night.
Yet still I rejoice when the travelers rejoice,
And weep with the strangers that moan;
Nor live in my house by the side of the road
Like a man that lives alone.

Let me live in a house by the side of the road
Where the race of men go by.
They are good, they are bad, they are weak, they are strong,
Wise, foolish; so am I.
Then why should I sit in the scorner's seat
Or hurl the cynic's ban?
Let me live in a house by the side of the road
And be a friend to man.*

I plead for more rather than less of this great subject. I also plead for proper time to gain its results. We hear a whisper now and then that too much time is given to it for the results produced. This may in some instances be true, but that is not the fault of the subject. With good teaching and proper study and time devoted to it the results are assured.

Finally I plead for more teachers capable and willing to enter into this spirit of mathematics, and who are willing to work hard, for work hard they must to attain its results, and who will find pleasure in doing and inspire their students with the same spirit. When we have these and when we as teachers give our best efforts the general public will appreciate more than they do now the real value of mathematics.

There are loyal hearts, there are spirits brave,
There are souls that are pure and true;
Then give to the world the best you have,
And the best will come back to you.

* "The House by the Side of the Road," by Sam Walter Foss. Printed here by permission.

Give love, and love to your heart will flow,
A strength in your utmost need;
Have faith, and a score of hearts will show
Their faith in your word and deed.

For life is the mirror of king and slave,
'Tis just what you are and do;
Then give to the world the best you have,
And the best will come back to you.*

SYRACUSE UNIVERSITY,
SYRACUSE, N. Y.

THE AMERICAN WORK OF THE INTERNATIONAL COMMISSION ON THE TEACHING OF MATHEMATICS.

BY DAVID EUGENE SMITH,

Chairman of the American Delegation.

The Fourth International Congress of Mathematicians, held at Rome in 1908, adopted a resolution empowering Professors Klein of Göttingen, Sir George Greenhill of London, and Fehr of Geneva to form an international commission for the investigation of the teaching of mathematics in the secondary schools of the different nations, and to report to the next congress, which is to be held in England in 1912. This committee on organization met and took counsel as to the method of selecting the members of the commission, and finally decided that each of the countries represented by at least two delegates in at least two international congresses should have two or three delegates. They also decided that countries participating in the congresses but not having the required number of representatives should be entitled to one delegate, and that other countries likely to contribute valuable information should be invited to name a delegate who should act without vote. The committee on organization further decided that inasmuch as the term "secondary schools" had various meanings in different countries, the investigation should consider the teaching of mathematics in a broader sense, covering the entire field from the first steps through the courses required for any line of advanced

* Anonymous.

work. Briefly, this may be described as the field of mathematics from the kindergarten through the work in the calculus, but inasmuch as it also concerns the preparation of teachers for all this field, it is necessarily extended to include the nature of the instruction in higher mathematics.

The work in America has been organized on a different basis from that in certain of the European countries, and necessarily so. One reason for this difference is that we have nearly fifty state governments, each with its own system of education, a condition paralleled only by the German Empire, and even there to not the same extent. Another reason is found in the fact that educational matters are less settled with us than is generally the case abroad, so that we have no such bodies of accumulated material to which we can at once turn for information. Still a third reason for our different plan of attack is seen in the fact that we have not so large a body of trained university investigators in our teaching force, with time for preparing exhaustive discussions of special educational topics, as is found for example in Germany. The business opportunities of the new world are such that we shall not for a long time to come see relatively as many men of high intellectual attainments in the teaching profession as are found in the more densely populated countries.

The American plan has been and is to carry on the investigation by means of committees, these committees to be divided into sub-committees, the latter making their reports this winter. The committees are expected to report before next summer, and the American report is due the following winter. This differs from the German plan in that the latter depends upon individuals instead of committees, and seeks for monographs instead of reports. As has been stated, each plan seems the best one for the country that has adopted it.

In America the following five topics have been designated by letter for convenience in reference: (*a*) The organization of schools and the general relation of each kind of school to the others; (*b*) the mathematical curriculum in each type of school; (*c*) the question of examinations, from the point of view of the school; (*d*) the methods employed in teaching mathematics; (*e*) the preparation of teachers of mathematics.

The committees and sub-committees thus far arranged to carry on the work are as follows:

I. GENERAL ELEMENTARY SCHOOLS.

Chairman, Superintendent C. N. Kendall, Indianapolis, Ind.

1. *Kindergarten.*

Chairman, Miss Patty Hill, Teachers College, Columbia University, New York.

Miss Alice Temple, Kindergarten Department, School of Education, The University of Chicago, Chicago, Ill.

Miss Elizabeth Harrison, Kindergarten College, 1200 Michigan Avenue, Chicago, Ill.

2. *Public and Private Schools—Grades 1-6, topics a-d.*

Chairman, Miss Theda Gildemeister, Normal School, Winona, Minn.

Miss Harriet Peat, Normal School, Salem, Mass.

Miss Julia Martin, Manchester, Mich.

Professor Henry Suzzallo, Columbia University, New York City.

Dr. C. W. Stone, Normal School, Farmville, Va.

3. *Same schools, Topic e.*

Chairman, F. G. Bonser, State Normal School, McComb, Ill.

Miss Lao G. Simons, Normal College, New York City.

Professor William J. MacAuliffe, Cathedral College, 462 Madison Avenue, New York City.

4. *Public and Private Schools, Grades 7 and 8, topics a-d.*

Chairman, W. W. Hart, Shortridge High School, Indianapolis, Ind.

Professor William L. Benitz, Notre Dame, Ind.

Dr. Henry V. Gummere, Drexel Institute, Philadelphia, Pa.

5. *Same Schools, Topic e.*

Chairman, Professor Ira S. Condit, Iowa State Teachers College, Cedar Falls, Ia.

J. O. Mahoney, Dallas, Tex.

Professor W. C. Bagley, University of Illinois, Urbana, Ill.

George Melcher, Normal School, Springfield, Mo.

Dr. C. O. Dewey, 467 MacDonough Street, Brooklyn, N. Y.

II. SPECIAL KINDS OF ELEMENTARY SCHOOLS.

Chairman, Professor George D. Strayer, Teachers College,
Columbia University, New York.

1. *Trade Schools, Topics a-d.*

Chairman, E. B. Kent, 9 Brunswick St., Jersey City, N. J.

Miss Mary E. Edwards, California School of Industrial Art,
Sixteenth and Utah Streets, San Francisco, Cal.

George B. Miller, Cogswell Polytechnic College, San Francisco, Cal.

2. *Corporation Industrial Schools, Topics a-d.*

Chairman, Henry Gardner, Assistant Superintendent of Apprentices, N. Y. C. R. R., New York City.

Major A. W. Lowe, American Society of Naval Engineers,
1 Olive Street, Lynn, Mass.

William D. Earnest, John Wanamaker Commercial Institute,
Tenth Street and Broadway, New York.

W. B. Russell, Director Franklin Union, Appleton and Berkeley Streets, Boston, Mass.

3. *Industrial Classes in Public Schools, Topics a-d.*

Chairman, H. S. Youker, Normal School, Oshkosh, Wis.

Jane Mathews, 50 Library Place, Allegheny, Pa.

T. O. Hubbard, Principal High School, Fond du Lac, Wis.

4. *Teachers for All the Above Schools.*

Chairman, Principal W. A. Baldwin, Normal School, Hyan-nis, Mass.

Miss Sarah J. Walter, Hampton Institute, Hampton, Va.

Principal Charles F. Warner, Technical High School, Springfield, Mass.

Superintendent Johnson, School for Feeble Minded, Vine-land, N. J.

John T. Prince, Agent Massachusetts Board of Education,
Newton, Mass.

III. PUBLIC GENERAL SECONDARY SCHOOLS.

Chairman, George W. Evans, Charlestown High School,
Boston, Mass.

1. *Boys' Schools, Topics a-d.*

Chairman, Henry M. Wright, English High School, Boston,
Mass.

John W. Regan, High School, Charlestown, Mass.

Samuel B. Tinsley, Male High School, Louisville, Ky.

Harry English, Central High School, Washington, D. C.

2. *Girls' High Schools, Topics a-d.*

Chairman, Ernest G. Hapgood, Girls' Latin School, Boston, Mass.

Miss A. Laura Batt, English High School, Summerville, Mass.

Emma H. Carroll, Girls' High School, 1629 South Sixteenth Street, Philadelphia, Pa.

Grace C. Alden, 84 Franklin Street, Lynn, Mass.

T. H. Garrett, Tubman High School, Augusta, Ga.

3. *Co-Educational Schools in the East, Topics a-d.*

Chairman, Charles D. Meserve, Newton High School, Newton, Mass.

Daniel D. Feldman, Erasmus Hall High School, 288 Rugby Road, Brooklyn, N. Y.

A. R. Taylor, High School, Montclair, N. J.

4. *The Same in the Middle West.*

Chairman, Charles Ammerman, 3640 Juniata Street, McKinley High School, St. Louis, Mo.

Miss Mabel Sykes, South Chicago High School, South Chicago, Ill. (438 E. 57th Street.)

Miss Lucie W. Allen, Laurium, Michigan.

Miss Edith Long, High School, Lincoln, Neb.

W. Lee Jordan, 2830 Battlebow Avenue, Des Moines, Iowa.

5. *The Same in the South.*

Chairman, Professor Floyd Field, Georgia School of Technology, Atlanta, Ga.

P. H. Underwood, Ball High School, Galveston, Tex.

Mrs. Annie E. Cooney, High School, 200 Market Avenue, Memphis, Tenn.

Alfred Livingston, Principal High School, Henderson, Ky.

6. *The Same on the Pacific Coast.*

Chairman, H. P. Gaylord, Throop Polytechnic Institute, Pasadena, Cal.

Professor C. A. Noble, 2731 Durant Avenue, Berkeley, Cal.

J. C. Keith, 1629 35th Avenue, Broadway High School, Seattle, Wash.

E. H. Barker, Polytechnic High School, 1940 Park Grove Avenue. Los Angeles, Cal.

Professor E. E. DeCou, 719 Mill Street, Eugene, Ore.

Miss T. A. Brookman, High School, Berkeley, Cal. (2246 Atherton Street).

Professor R. E. Moritz, Seattle, Wash.

7. *Teachers for All the Above, Topic c.*

Chairman, Professor L. D. Ames, The University of Missouri, Columbia, Mo.

Dr. L. C. Karpinski, The University of Michigan, Ann Arbor, Mich.

F. C. Touton, The High School, Kansas City, Mo.

Oscar W. Anthony, DeWitt Clinton High School, New York City.

8. *The Six Year Curriculum.*

Chairman, Professor Arthur Sullivan Gale, The University of Rochester, Rochester, N. Y.

Dr. C. T. McFarlane, Principal of the State Normal School, Brockport, N. Y.

Miss Katherine Bell, High School, Lead, S. D.

Gilbert B. Morrison, Principal McKinley High School, St. Louis, Mo.

William H. Norton, Boys' Latin School, Boston, Mass.

9. *Failures in the Technique of Secondary Teaching of Mathematics: Their Causes and Remedies.*

Chairman, William Betz, East High School, Rochester, N. Y..

Miss M. E. Shea, High School for Girls, 4404 Samson Street, Philadelphia, Pa.

Miss Mary M. Wardwell, Central High School, Buffalo, N. Y.

H. E. Webb, High School, Newark, N. J.

IV. PRIVATE GENERAL SECONDARY SCHOOLS.

Chairman, Principal W. E. Stark, Ethical Culture School,
Central Park West, New York.

I. *Boys' Schools, Including Religious and Military, Topics a-e.*

Chairman, Dr. John S. French, Principal Morris Heights School, Providence, R. I.

Walter R. Marsh, Principal St. Paul's School, Garden City, N. Y.

Dr. J. L. Patterson, Principal Chestnut Hill Academy, Chestnut Hill, Philadelphia.

Professor William Schwartz, Cathedral College, 462 Madison Avenue, New York.

William Hughes, Principal Branham and Hughes School, Spring Hill, Tenn.

Josiah Bartlett, Riverview Academy, Poughkeepsie, N. Y.

Franklin T. Jones, University School, Cleveland, Ohio.

2. *Girls' Schools, Including Religious, Topics a-c.*

Chairman, S. A. Courtis, Detroit Home and Day School, Detroit, Mich.

Miss Emma M. Cowles, Milwaukee Downer College Milwaukee, Wis.

Miss Sarah M. Lake, Miss Winsor's School, 95 Beacon Street, Boston, Mass.

Brother Potamian, Manhattan College, New York City.

Dr. Ruth G. Wood, Smith College, Northampton, Mass.

Harriet D. Buckingham, Girls' High School, Lexington, Mass.

Dr. Virginia Ragsdale, Baldwin School, Bryn Mawr, Pa.

Miss Vevia Blair, Sachs School for Girls, New York City.

3. *Co-Educational Schools, Topics a-e.*

Chairman, C. W. Newhall, Shattuck School, Faribault, Minn.

C. H. Albright, Colorado College, Colorado Springs, Colo.

E. R. Breslich, University High School, University of Chicago.

George P. Tibbetts, Williston Seminary, East Hampton, Mass.

E. J. Owen, Pillsbury Academy, Owatonna, Minnesota.

Laura A. Whyte, Norwich Free Academy, Norwich, Conn.

V. NORMAL SCHOOLS.

Chairman, E. H. Taylor, State Normal School, Charlestown, Ill.

1. *State Normal Schools, Topics a-d.*

Chairman, H. Clay Harvey, State Normal School, Kirksville, Mo.

S. F. Parsons, State Normal School, DeKalb, Ill.

Dr. J. D. Faught, State Normal School, Marquette, Mich.

J. C. Stone, Montclair, N. J.

William A. Cornish, State Normal School, Cortland, N. Y.
George C. Shutts, State Normal School, Whitewater, Wis.
W. C. Vernon, Austin, Tex.

2. *Private Normal Schools.*

Chairman, M. E. Bogarte, Normal University, Valparaiso, Ind.

Fred L. Pauly, National Normal University, Lebanon, Ohio.
Thomas W. Keenan, Shenandoah, Iowa.
Albert J. Harpman, Austin, Minn.

3. *Teachers for Normal Schools.*

Chairman, J. C. Brown, State Normal School, Charleston, Ill.
Joseph V. Collins, Stevens Point, Wis.
George W. Hull, Millersburg, Pa.
J. H. Scarborough, Warrensburg, Mo.
Sands Wright, Cedar Falls, Iowa.

VI. TECHNICAL SECONDARY SCHOOLS.

Chairman, Professor C. N. Haskins, 46 S. Main Street.
Dartmouth College, Hanover, N. H.

1. *Public, Private and Corporation Trade Schools.*

Chairman, F. D. Crawshaw, University of Illinois, Urbana, Ill.
Professor N. C. Riggs, Carnegie Technical Institute, Pittsburgh, Pa.

Dr. H. V. Gummere, Drexel Institute, Philadelphia, Pa.

Professor C. A. Bennett, Bradley Polytechnic Institute, Peoria.

C. F. Berry, Principal Milwaukee Trade School.

E. C. Barker, Polytechnic High School, Los Angeles, Cal.

E. R. Smith, Brooklyn Polytechnic Preparatory School, Brooklyn, N. Y.

2. *Commercial Schools, Public and Private.*

Chairman, J. E. Downey, High School of Commerce, Worthington Street, Boston, Mass.

Dr. J. T. Rorer, William Penn High School, Philadelphia, Pa.

Raymond G. Laird, 22 Rockview St., Jamaica Plain, Mass.

Miss Clara Eaton, 206 West 39th Street, New York City.

3. *Agricultural Schools.*

Chairman, Professor J. E. Ostrander, Mass. Agricultural College, Amherst, Mass.

Dr. L. F. Stevens, West Raleigh, N. Carolina.

Dr. Tait Butler, Starkville, Miss.

VII. MISCELLANEOUS TYPES OF SECONDARY AND OF ELEMENTARY SCHOOLS NOT INCLUDED UNDER II.

Chairman, Superintendent William H. Elson, Cleveland, Ohio.

1. *Evening Technical Schools.*

Chairman, A. D. Dean, Albany, N. Y., Chairman State Department of Education.

2. *Private Correspondence Schools.*

Chairman, W. F. Rocheleau, Interstate School of Correspondence, Chicago, Ill.

3. *Schools for Licensed Accountants.*

Chairman, W. D. Higdon, McKinley High School, St. Louis, Mo.

Charles Leckrone, Manual Training School, St. Louis, Mo.

I. Allison Gaines, McKinley High School, St. Louis, Mo.

4. *Schools for Negroes and Indians.*

Chairman, Kelly Miller, Howard University, Washington, D. C.

VIII. EXAMINATIONS IN MATHEMATICS OTHER THAN THOSE SET BY THE TEACHER FOR HIS OWN CLASSES.

Chairman, Professor T. S. Fiske, Columbia University, N. Y.

1. *Nature of Promotion in Elementary Schools and Admission to Secondary Schools.*

Chairman, H. C. Pearson, Horace Mann School, New York City.

H. B. Loomis, Hyde Park High School, Chicago, Ill.

John S. Rackliffe, Huntington School, Brockton, Mass.

R. M. Sherrard, Sub-district School, Pittsburgh, Pa.

Professor A. Duncan Yocum, University of Pennsylvania, Philadelphia, Pa.

Dr. C. W. Stone, Farmville, Va.

2. *Entrance to College by College Examinations.*

Chairman, Professor H. D. Thompson, Princeton, N. J.

Professor J. L. Coolidge, Harvard University, Cambridge, Mass.

- Professor Julius Sachs, Columbia University, N. Y.
Professor L. S. Hulburt, Johns Hopkins University, Baltimore, Md.
Principal J. B. Schobinger, The Harvard School, Chicago.
3. *The Same by College Entrance Board Examinations.*
Chairman, Professor V. Snyder, Cornell University, Ithaca, N. Y.
Professor R. W. Prentiss, Rutgers College, New Brunswick, N. J.
Professor C. L. E. Moore, Massachusetts Institute of Technology, Boston, Mass.
Miss C. A. Hart, Wadleigh High School, 163 West 105th Street, New York.
4. *The Same by State Examinations.*
Chairman, Dr. C. F. Wheelock, Bureau of Education, Albany, N. Y.
President J. M. Taylor, Vassar College, Poughkeepsie, N. Y.
Superintendent F. D. Boynton, Ithaca, N. Y.
5. *The Same by Certification.*
Chairman, Professor N. F. Davis, Brown University, Providence, R. I.
Professor E. S. Crawley, University of Pennsylvania, Philadelphia, Pa.
Professor George C. Edwards, University of California, Berkeley, Cal.
Professor W. W. Beman, Ann Arbor, Mich.
Professor William M. Thornton, University of Virginia, Charlottesville, Va.
6. *State and Local Examination of Teachers.*
Chairman, Hon. Robert J. Aley, Indianapolis, Ind.
J. C. Byrnes, 500 Park Avenue, New York City.
Harry English, High School, Washington, D. C., 2907 P St., N. W.
7. *Civil Service and Other State Systems of Examinations.*
Chairman, Charles S. Fowler, 165 Broadway, New York City.
Gordon Colby, Chief Examiner Civil Service, Trenton, N. J.
G. R. Wales, Chief Examiner, U. S. Civil Service Commission, Washington, D. C.
Henry Sherwin, Chief Examiner, Civil Service Commission, Boston, Mass.

8. *Examination of Actuaries.*

Chairman, J. K. Gore, President of the Actuarial Society of America, Actuary of the Prudential Life Insurance, Newark, N. J.

Dr. H. J. Messenger, Actuary of the Travelers, Hartford, Conn.

Dr. William M. Strong, Assistant Actuary of the Mutual Life Insurance of New York, 32 Nassau Street, New York City.

Mr. Dow, Actuary of the N. E. Mutual Life Insurance Co.

IX. MATHEMATICAL WORK IN AMERICAN POSSESSIONS.

Chairman, Dr. Fred W. Atkinson, President of the Polytechnic Institute, Brooklyn, N. Y.

1. *In the Philippine Islands.*

Chairman, Hon. David P. Barrows, Manila, P. I.

2. *In Hawaii.*

Chairman, Hon. W. H. Babbitt, Honolulu, Hawaii.

3. *In Porto Rico.*

Chairman, Hon. Edwin G. Dexter, San Juan, Porto Rico.

4. *In Alaska.*

Chairman, Hon. Wilford B. Hoggatt, Governor of Alaska.

X. INFLUENCES TENDING TO IMPROVE THE WORK OF THE TEACHER.

Chairman, Professor E. P. Cubberley, Leland Stanford, Jr., University, Palo Alto, Cal.

1. *Scientific Societies and Periodical Literature.*

Chairman, Professor F. N. Cole, Columbia University, New York.

Professor W. H. Metzler, Syracuse University, Syracuse, N. Y.

Professor, J. E. Gould, The University of Washington, Seattle, Wash.

Professor B. F. Finkel, Drury College, Springfield, Mo.

Dr. Thomas J. MacCormack, La Salle, Ill.

2. *Teachers' Associations, Including Reading Circles.*

Chairman, Professor Gustave Legras, College of the City of New York, New York City.

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William E. Breckenridge, Stuyvesant High School, New York City.

D. M. Philip, College of the City of New York.

W. A. Merrill, West High School, Des Moines, Ia.

George Alvin Snook, Central High School, Philadelphia, Pa.

John B. Cleveland, Normal School, Los Angeles, Cal.

3. *Teachers' Institutes.*

Chairman, Dr. A. W. Stamper, Chico, Cal.

William Fletcher, Principal, High School, Pueblo, Col.

H. M. Cook, Clifton, N. J.

Superintendent O. I. Woodley, Passaic, N. J.

4. *State Inspection and Supervision of Instruction.*

Chairman, Professor E. B. Skinner, The University of Wisconsin, 210 Lathrop Street, Madison, Wis.

Dr. E. W. Lyttle, Department of Education, Albany, N. Y.

Dr. John E. Clarke, Cambridge, Mass.

5. *Activities of Publishers and their Agents.*

Chairman, Dr. L. L. Jackson, care of D. Appleton & Co., 29 W. 32nd St., New York City.

D. W. Hall, care of Ginn & Co., 2301 Prairie Avenue, Chicago.

R. L. Short, Technical High School, Cleveland, Ohio.

XI. TECHNOLOGICAL SCHOOLS OF COLLEGIATE GRADE.

Chairman, Professor H. W. Tyler, Massachusetts Institute of Technology.

1. *Independent Technological Schools.*

Chairman, Professor C. S. Howe, Case School of Science, Cleveland, Ohio.

Professor A. M. Kenyon, Purdue University, Lafayette, Ind.

Professor D. F. Campbell, Armour Institute, Chicago, Ill.

2. *Technological Departments of Colleges and Universities.*

Chairman, Professor A. Ziwet, Ann Arbor, Mich.

Professor E. R. Hedrick, Columbia, Mo.

Professor E. V. Huntington, Cambridge, Mass.

Professor E. E. Slocum, The University of Cincinnati, Cincinnati, Ohio.

XII. OTHER PROFESSIONAL SCHOOLS OF COLLEGIATE GRADE
SEPARATE OR CONNECTED WITH COLLEGES OR UNIVERSITIES.

Chairman, Professor G. W. Myers, School of Education, The
University of Chicago, Chicago, Ill.

1. *For the Training of Teachers.*

Chairman, C. B. Upton, Teachers College, Columbia Uni-
versity, New York.

Professor R. D. Bohannon, Ohio State University, Columbus,
Ohio.

Professor A. L. Candy, University of Nebraska, Lincoln, Neb.

Professor C. D. Rice, University of Texas, Austin, Texas.

Professor L. G. Weld, State University of Iowa, Iowa City,
Iowa.

2. *For the Training of Army Officers, Including Schools for
Graduates of West Point.*

Chairman, Professor C. P. Echols, West Point, N. Y.

Major Tracy C. Dickson, Ordnance Department, Sandy
Hook, N. J.

Captain Alston Hamilton, Artillery School, Fortress Monroe,
Va.

3. *For the Training of Naval Officers, Including Schools for
Graduates of Annapolis.*

Chairman, W. J. King, Annapolis, Md., 232 Prince George St.

Professor E. J. Yowell, Annapolis, Md.

Professor C. H. Sisam, Urbana, Ill.

XIII. COLLEGES OF LIBERAL ARTS AND UNDERGRADUATE WORK
IN UNIVERSITIES STATE AND ENDOWED.

Chairman, Professor H. S. White, Poughkeepsie, N. Y.

1. *Men's Colleges.*

Chairman, Professor F. C. Ferry, Williamstown, Mass.

Professor L. P. Eisenhart, Princeton University, 63 Little
Hall, Princeton, N. J.

Professor L. S. Hulburt, Johns Hopkins University, Balti-
more, Md.

2. *Women's Colleges.*

Chairman, Dr. W. H. Maltbie, 703 Law Building, Balti-
more, Md.

3. *Co-Educational Colleges.*

Chairman, Professor Thomas F. Holgate, Northwestern University, Evanston, Ill.

Professor Sellew, Knox College, Galesburg, Ill.

Professor Keppel, The University of Florida, Gainesville, Fla.

Professor T. A. McKinney, The University of South Dakota, Vermillion, S. D.

Professor James W. Glover, University of Michigan, Ann Arbor, Mich.

XIV. GRADUATE WORK IN UNIVERSITIES AND IN OTHER INSTITUTIONS OF LIKE GRADE.

Chairman, Professor Maxime Bôcher, Harvard University, Cambridge, Mass.

1. *Courses of Instruction.*

Chairman, Professor D. R. Curtis, Northwestern University, Evanston, Ill.

Professor Edward Kasner, Columbia University, New York.

Dr. A. C. Lunn, The University of Chicago, Chicago, Ill.

2. *Preparation for Research and the Doctor's Degree.*

Chairman, Professor Percy F. Smith, Yale University, New Haven, Conn.

Professor M. B. L. Mason, The University of Wisconsin, Madison, Wis.

Professor E. J. Wilczynski, The University of Illinois, Urbana, Ill.

Professor J. I. Hutchinson, Cornell University, Ithaca, N. Y.

Professor G. D. Birkhoff, The University of Wisconsin, Madison, Wis.

3. *Preparation of Instructors for Colleges and Universities.*

Chairman, Professor E. B. Van Vleck, The University of Wisconsin, Madison, Wis.

Professor H. E. Slaught, The University of Chicago, Chicago, Ill.

Professor C. L. Bouton, Harvard University, Cambridge, Mass.

Professor H. E. Hawkes, Yale University, New Haven, Conn.

Professor G. D. Olds, Amherst College, Amherst, Mass.

XV. GENERAL QUESTIONS.

Chairman, Professor H. E. Cobb, Lewis Institute, Chicago, Ill.

1. *Schematic Survey of American Educational Institutions, Their Sequence and Interrelations.*

Hon. David Snedden, State Commissioner of Education, Boston, Mass.

Professor J. H. Tanner, Cornell University, Ithaca, N. Y.

Professor E. Holland, University of Indiana, Bloomington, Ind.

Superintendent E. E. Spaulding, Newton, Mass.

Professor Edward C. Elliott, Madison, Wis.

2. *The Scope and Arrangement of the Mathematical Curriculum in Elementary and Secondary Schools.*

Chairman, Professor C. E. Comstock, Bradley Polytechnic Institute, Peoria, Ill.

Dr. D. E. Felmley, Normal, Ill.

A. M. Curtis, Normal School, Oneonta, N. Y.

Principal E. L. Brown, North High School, Denver, Colo.

Dr. J. T. Rorer, Central High School, Philadelphia, Pa.

Professor Charles H. Ashton, University of Kansas, Lawrence, Kansas.

Professor F. B. Williams, Clark University, Worcester, Mass.

E. E. Whitford, College of the City of New York, New York City.

As to the membership of these committees it is proper to say that numerous other teachers of mathematics, or teachers interested in mathematics, were asked to serve as members. From most of them no replies were received, possibly because they never received the invitation (and it is known that some of these letters were lost), and possibly because the commissioners never received their replies. The amount of correspondence required in starting the work has been much greater than would be thought necessary by one not familiar with the difficulties, so that it is not strange that some letters never reached their destinations.

The work of the commission came to it unsought, but it has been laid upon the members as a duty that they cannot decline to assume. In the same way the duty has been laid upon the committees and the sub-committees to assist in finding out for

ourselves, and in making known to the world, exactly what we are doing in this country in the teaching of mathematics. It is no easy task to do this work, and it must be done *con amore* and at much sacrifice. Nevertheless there will be ample return, for we shall know our own work as never before, and eventually we shall have in succinct form a report submitted to the Fifth International Congress of Mathematicians that shall also tell us what other nations are doing and planning to do. The stimulating effect of this knowledge, of this intermingling of the ideas of individuals and of states and of nations, cannot fail to make for clearer aims and better work everywhere. To know the best standards, to see the best results, to be advised of the best purposes, to discuss the best means—all this will be abundant recompense for every effort put forth to make the American report a success.

NOTES AND NEWS.

THE American Federation of Teachers of the Mathematical and the Natural Sciences is about to issue to members of the federated associations Bulletin No. 2. The Federation now comprises fourteen associations, representing a total membership of some two thousand teachers, distributed from the Atlantic to the Pacific. It is noteworthy that the Middle States Association of Teachers of Mathematics is the largest association included in the federation.

Bulletin No. 2 will contain reprints of the papers read before the federation at the Baltimore Meeting during Convocation Week, 1908. These comprise a discussion of the problems of science teaching, with the subdivisions—Physics, George F. Stradling; mathematics, William T. Campbell; botany, John M. Coulter; physical geography, N. M. Fenneman.

The annual meeting of the federation will be held at the Massachusetts Institute of Technology in Boston, Mass., December 27 and 28. Some of the meetings will be joint sessions with Section L of the American Association for the Advancement of Science. The federation has three committees at work from which reports are expected: (1) On Publication; (2) On a Syllabus in Geometry; (3) On the College Entrance Problem.

The last committee, with a view of definitely fixing the abuses

in college entrance examination papers, or of entrance requirements, and with the final purpose of recommending such action as will tend to make these requirements more uniform, has through Dr. J. T. Rorer, of Philadelphia, requested the principals of fifty leading schools throughout the country to reply to the following questions:

"Are the present entrance requirements of the colleges, universities and technical schools, and of the College Entrance Examination Board, in mathematics and in science (exclusive of physics, which is the subject of a separate inquiry) satisfactory to you? If not, please state in what respect they are unsatisfactory and indicate some cases where individual colleges, or where the board, by excessive or unusual requirements, work a hardship upon the schools."

ABOUT thirty-five teachers attended the meeting of the Rochester Section held October 9, at which the following papers were presented:

"Report of Committee on Regents' Syllabus," by Miss K. L. Caring, West High School, Rochester.

"Impressions of Mathematical Work in the British Schools," by Miss M. M. Wardwell, Central High School, Buffalo.

"Various Approximations of the Area of a Unit Circle," by Mr. W. H. Sherk, Lafayette High School, Buffalo.

"The International Commission on the Teaching of Mathematics," by Mr. W. Betz, East High School, Rochester.

"The Locus Problem," by Mr. A. S. Gale, The University of Rochester.

The section adopted resolutions recommending to the regents of the University of the State of New York that various changes be made in the present syllabus for mathematics.

Miss Wardwell was one of a large number of teachers to spend some weeks in England last year, and she presented many interesting comparisons of the work there and in this country.

The most important point developed by Mr. Sherk was that computations, too laborious for class use, by means of various well-known methods of approximating areas do not yield as accurate values of π as simple experimental methods.

Mr. Betz outlined the work of the International Commission

and American commissioners to the present time, while Professor Gale's paper was a reproduction of that read before the association at Syracuse.

Three applications for membership were received.

The following officers were elected for the year:

Chairman, Mr. W. L. Vosburgh, Brockport.

Secretary, Professor A. S. Gale, Rochester.

Executive Committee, in addition to the chairman and secretary, Mr. W. Betz, Rochester; Mr. W. M. Bennett, Rochester, and Miss E. M. Peirce, Lockport.

The by-laws were amended so that hereafter the meetings of the section will be held on the first Saturday in November and March.

THE NEW YORK SECTION held its first meeting of the year on November 12 with the following program: "Mathematics for Service," by E. R. von Nardroff; "Mathematics for Training and Culture," by W. H. Metzler.

THE American Commissioners of the International Commission on the Teaching of Mathematics earnestly request all to whom questionnaires have been addressed to send in their replies at the earliest possible moment. If this country is to prepare a set of reports that shall show the work that is being done, and to have these reports ready when those of other countries are presented, a great deal of hard work must be done this winter, and therefore prompt replies are necessary.

THE FALL MEETING of the Philadelphia Section was held Wednesday, November 17, at the Central High School, Chairman G. A. Snook, presiding. A new plan was followed in the Common Errors in Elementary Algebra." The work had been divided among three committees: I., Classification; II., Probable Causes; III., Suggested Remedies.

The Committee on Classification presented a list of thirty-two common errors which frequently appear in first-year work. Miss Shaw, of the William Penn High School, in reporting for the committee told how the list represented the experience of many teachers and that many of these errors were found in examinations in spite of excellent teaching.

J. Eugene Walker reported for the Committee on Probable Causes. Among the contributing causes, he found lack of clear thinking and reasoning in arithmetic; the use of careless language as, "Change sides, change signs"; insufficient drill in the use of fundamental symbols; and forcing pupils with undue rapidity.

Dr. George C. Chambers, of the University of Pennsylvania, suggested in behalf of his committee a specific "cure" for each of the typical errors. The substitution of familiar numbers, verifying all roots, the statement of a reason for each step, were among his suggestions. Many members of the section afterward took part in the general discussion.

The list of errors will be found in the next issue.

THE ANNUAL MEETING of the association was held at the College of the City of New York on December 4, 1909. In the absence of the president, Dr. Metzler, of Syracuse University, was elected chairman. The following business was transacted:

The council authorized the secretary to make a report of its year's work to the federation. In case of his inability to be present at the meeting, he was authorized to appoint an alternate to present his report.

The council expressed itself as in favor of THE MATHEMATICS TEACHER becoming a representative journal for all associations of teachers of mathematics connected with the American Federation, and referred the matter to a committee of five as follows: The Publication Committee, consisting of Dr. W. H. Metzler, Eugene R. Smith, Dr. J. T. Rorer, with the addition of Dr. W. H. Maltbie and Miss M. Edna Shaw.

The list of proposed members was approved as follows:

- N. Y. ALLEN, FISKE, A.B.; Horace Mann High School, New York. 511 W. 122d St.
ATWOOD, GEORGE EDWARD; Principal Newburg High School, Newburgh, N. Y.
N. Y. BAKER, ELEANOR R., A.B.; Manual Training High School, Brooklyn. 469 Fourth St.
P. BENTLEY, GRACE LILLIAN; 1440 N. 13th St., Philadelphia, Pa.
BROWN, CHARLES GUY, A.M.; High School, Englewood, N. J. 12 Grove St.

- N. Y. CHENEY, THOMAS CLYDE; Hamilton Institute for Boys. 45 W. 81st St., New York.
- P. CHILD, STANLEY GANSLER, E.E., M.E.; Southern High School, Philadelphia. 20 S. 10th St.
- N. Y. CLARK, RANDOLPH F., A.B., Pd.B.; Collegiate School, New York. Christie Heights, Leonia, N. J.
- R. COFFIN, LEROY M., B.S.; Keuka College, Keuka Park, N. Y.
- CROUSE, FLORENCE BEARD; Miss Dana's School, Morristown, N. J. 221 South St.
- P. EVANS, MARY ADELLE; William Penn High School, Philadelphia. 1736 Mt. Vernon St.
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- R. FOOTE, ROGER B., B.S.; High School, Albion, N. Y. 30 E. State St.
- FRIEDHOFF, HENRY WILLIAM; 36 N. Edgewood St., Philadelphia.
- R. GREGORY, FRANCES MAY; Central High School, Buffalo, N. Y. 1268 Main St.
- P. HARDY, ELIZA GRACE, A.B.; William Penn High School, Philadelphia. 1909 N. 11th St.
- HAYES, GEORGE M., A.B.; City College, New York. 1920 Anthony Ave.
- N. Y. HAZEN, LOUISE COLEMAN, A.B.; Wadleigh High School, New York. 68 Washington Square, South.
- N. Y. HENRIQUES, MAURICE C., A.B.; Stuyvesant High School, New York.
- P. HOLBROOK, ALICE M.; High School for Girls, Philadelphia. 1620 Diamond St.
- P. HUGHES MARTHA J., A.B.; High School for Girls, Philadelphia. 218 W. Walnut Lane, Germantown, Pa.
- LAMBERT, WALTER DAVIS, A.M.; University of Pennsylvania, Philadelphia. College Hall.
- N. Y. LANGHORNE, AGNES SWINTON, A.B.; Normal College, New York. Plainsfield, N. J.
- N. Y. LOCKE, L. LELAND, A.M.; Training School for Teachers, Brooklyn. 987 Lincoln Place.
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- P. MOORE, HENRY S., B.S.; N. E. Manual Training High School, Philadelphia. 1215 Russel St.
- N. Y. O'BRIEN, WILLIAM J.; 208 Adelphi St., Brooklyn.
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- POWELL, H. WHEELER, B.S.; City College, New York.
- PRATT, CHARLES H., A.B.; High School, Passaic, N. J. 275 Lafayette Ave.
- P. RAGSDALE, VIRGINIA, Ph.D.; The Baldwin School, Bryn Mawr, Pa.

- S. ROTH, ELFRIEDA H., Pd.B.; High School, Watervliet, N. Y. 1810 Fourth Ave.
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- N. Y. WOODWARD, CHARLES S.; High School, Jersey City. 672 Bergen Ave.
- P. WYNKOOP, PERCY; Southern High School, Philadelphia.
- N. Y. YOUNG, LOUISE ARMSTRONG, A.B.; Normal College, New York. 51 W. 106th St.
- ZINN, JOHN R., A.B.; City College, New York.

The treasurer was empowered to drop from the list of members all those whose dues are now three years in arrears, unless they reply within one month to a final notice.

The council elected as its Publication Committee (editors of THE MATHEMATICS TEACHER): For three years, Dr. W. H. Metzler, chairman; for two years, Eugene R. Smith; for one year, Dr. J. T. Rorer.

Professor W. H. Metzler's report for the Publication Committee was as follows: THE MATHEMATICS TEACHER is receiving excellent recognition from all quarters; many letters of commendation have been received, and as yet, no word of criticism. Subscriptions are coming in from individuals and libraries, some of them to begin with Vol. I, Number I, showing that the magazine is making a place for itself.

To put it where it is has cost much labor and time and keep it

there and to improve it will cost more. If every member of our association will coöperate and take an interest in it there is no question about its improvement and its future. It should be in the library of every college and of most schools in our territory, and in the public libraries of our cities, so that its influence can be much more widely diffused. Every one can help by increasing its circulation and by securing first-class articles for its pages. If any one can help us secure high-grade advertisements the committee will consider it a great favor to hear from them.

It is often possible for the editor to secure books and other things at a lower rate than can the members of our association, and he will, if possible, be glad to do this for members who will write him concerning their needs.

Let every one do what he can to coöperate with the committee in making *THE MATHEMATICS TEACHER* a successful publication.

The council authorized the Publication Committee to draw upon the treasurer for the expenses of publication up to a limit of two hundred and fifty dollars for the year's issues. The committee was authorized to publish the list of members and the revised constitution.

The council regretted the apparent inactivity of the Pittsburg Section, and the secretary and treasurer were authorized to correspond with the officers in an effort to stimulate its growth and activity.

The financial reports of the treasurer and Publication Committee, as appended, were audited and found correct, and the treasurer was authorized to pay the expenses incurred by the Algebra Syllabus Committee.

REPORT OF EMMA H. CARROLL, TREASURER, DECEMBER 4, 1909.

RECEIPTS.

Cash on hand, November 28, 1908.....	\$358.53
Dues received	427.20
Interest	7.75
	<u>\$793.48</u>

DISBURSEMENTS.	
Philadelphia Section	\$ 26.25
New York Section	15.00
Rochester Section	6.20
Syracuse Section	5.00
Secretary's Office	20.25
Treasurer's Office	41.30
Expense	25.75
Joint Bulletin, Number 2.....	173.44
Mathematics Teacher	245.00
Balance, December 4, 1909.....	226.29
	\$793.48

FINANCIAL STATEMENT OF THE EDITOR FOR THE YEAR ENDING
NOVEMBER 25, 1909.

Paid out for	
Rubber stamps, exchange, express and postage.....	\$ 23.06
Printing five numbers and stationery.....	510.78
	\$533.84
Received from	
Treasurer	\$245.00
Subscriptions	10.90
Reprints	20.17
Advertising	302.70
	\$578.77
	533.84
Balance on hand.....	\$ 44.93

The following amendment to the constitution was adopted:
Amend Article 3 of the Constitution to read:

The officers of this association shall be a president, a vice-president, a secretary and a treasurer. These four officers, together with the chairman of the Editorial Committee hereinafter provided for, and six additional members shall form the council. The president, vice-president, secretary and treasurer shall be elected at the annual meeting, and shall hold office for one year, or until their successors are chosen. Two of the other six members of the council shall be elected at the annual meeting and shall hold office for three years, except that at the first annual meeting two shall be chosen for one year, two for two years, and two for three years. The president may be reelected; but no one may at any time hold the office of president for more than two consecutive years.

It shall be the duty of the council to pass on applications for

membership, to arrange for all meetings of the association, to appoint committees, and to transact all business of the association arising between meetings of the association.

At the annual meeting of 1909, the council shall appoint an Editorial Committee of three members, one to serve one year, one two years and one three years. The council shall annually thereafter appoint one member of the committee to serve for three years, and shall designate the chairman of the committee for the ensuing year. Said members of the committee shall serve until their successors are appointed, and shall have charge of all the publications of this association excepting the notices sent out by the secretary, but shall not have power to incur financial liability, unless with the consent of the council.

The following officers were elected for the year 1909-1910:
President: William H. Metzler, Syracuse University, Syracuse, N. Y.

Vice-President: Daniel D. Feldman, Erasmus Hall High School, Brooklyn.

Secretary: Eugene R. Smith, Polytechnic Preparatory School, Brooklyn.

Treasurer: M. Edna Shaw, William Penn High School, Philadelphia, Pa.

Council Members: To serve two years (in place of Dr. Metzler), Paul N. Peck, George Washington University, Washington, D. C. To serve three years, Howard F. Hart, High School, Montclair, N. J.; Isaac J. Schwatt, University of Pennsylvania, Philadelphia.

Mr. William E. Stark, chairman of the Committee on Private Secondary Schools, appointed by the International Commission, made announcement of the work of the committee, and requested the coöperation of the members of the association to whom questionnaires should be sent.

Professor Gustave Le Gras, chairman of the Algebra Syllabus Committee, presented the report of the committee to the association. The syllabus was taken up by sections, and after some minor corrections and amendments was approved by the association. The committee was continued and will still farther amend the report as the sentiment of the association may indicate. It is hoped by the committee that members of the association will feel it their duty to communicate to the chairman any criti-

cisms or suggestions they may have. The committee will also prepare a syllabus for advanced algebra. Copies of the preliminary report of the committee were sent to all members in the December number of *School Science and Mathematics*. The final report will be published by THE MATHEMATICS TEACHER.

The next meeting place of the association has not been decided upon by the council, and invitations for the spring meeting may be sent to the secretary between now and the first of January.

The morning session of the association was largely given up to the reading and discussion of the two following papers: "Mathematics in the Ethical Culture High School," by Charles B. Walsh, New York. Some Suggestions in the Teaching of Geometry," by Isaac J. Schwatt, University of Pennsylvania.

Between sessions the association members inspected the Great Hall of the City College, and enjoyed a luncheon served in the Faculty Lunch Room.

Many of the members of this association are neglectful of their opportunities in failing to attend its meetings. When those present find enough of interest to keep them, as happened at this meeting, until nearly six o'clock, it seems as if those who lacked the ambition to attend might well have found the meeting of value. It seems in place to remind the members that a progressive teacher of mathematics can hardly afford not to keep in touch with current thought on his subject, and that this association is doing as much as any body of teachers in this country to give its members opportunity for such coöperation.

EUGENE R. SMITH,
Secretary.

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